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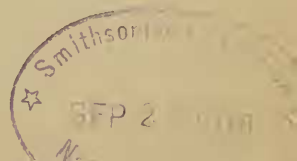
NOTES ON WEST AMERICAN CHITONS—II.

BY S. STILLMAN BERRY, REDLANDS, CALIFORNIA

3. ON THE GENERIC OR SUBGENERIC POSITION OF CERTAIN  
WEST AMERICAN CHITONS

Specimens now in hand of the two Australian species, *Ischnochiton australis* (Sowerby) and *I. novæhollandiæ* Gray, make it evident that most of the species from other regions which have been associated with them in the section or subgenus *Ischnoradsia* of Shuttleworth, of which the former species must be taken as the type, have no true relations with them whatever. One of our West North American species which has clearly been incorrectly included here is the aberrant *Ischnochiton trifidus* Carpenter, 1864. As this species appears to have no close connection with any other known to us, while it offers several rather remarkable features of its own, I propose to make it the type of a new group, *Tripoplax*, which for the time being may be tentatively referred to *Ischnochiton* as a subgenus. In the true *Ischnoradsia*, not only is the sculpture, especially that of the lateral and terminal areas, of a different order, but the girdle scales are relatively quite large, thick and heavy, and bear a conspicuous vertical carination on their outer aspect. In the West American species the lateral and terminal areas have only a rela-

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tively small number of low, flat, smooth, even ribs, and the proportionally much smaller girdle scales, which become even more minute toward the margin, are without any undue outer thickening or carination. In passing it may be noted that the so-called "Ischnoradsias" of Northern Japan can evidently be associated neither with the Australian species nor with *I. trifidus*. This phase of the matter will be treated more in detail upon a subsequent occasion in connection with a discussion of the radular characters.

*Ischnochiton regularis* (Carpenter 1855) was referred by Pilsbry ('92, p. 142) to his section *Radsietta*, evidently because of its radsiid valves. But *Radsietta*, as he has it, is an even more heterogeneous assortment than *Ischnoradsia*, the species referred to it including not only *I. tridentatus* Pilsbry from Lower California as type, and *I. regularis*, but also *I. viridulus* (Couthouy) from Tierra del Fuego, the *I. trifidus* above mentioned, and *I. tigrinus* (Krauss) from the Cape of Good Hope. I am not sure that the actual degree of relationship is sufficiently close for the association of any two of these in the same group: certainly the three West American forms have each striking peculiarities to distinguish them. Quite recently Thiele (:10, p. 112, 113) has shown that the radular characters of *regularis* indicate an affinity with the otherwise very different appearing *Lepidozona* and *Callistochiton*. This fact, together with the multiplication of insertion slits and other shell characters, causes me to propose here a second new group, *Rhombochiton*, to rank near or under *Lepidozona*, with *I. regularis* (Carpenter) as type. On my labels I am retaining both of these groups under *Ischnochiton* until certain further investigations upon which I am engaged can be carried through to completion. I do not think that our present knowledge of the detailed morphology of either the shell or the radula can be implicitly trusted to provide the key for working out the true relationships of all these groups, so as conservative a treatment as possible seems now the safest to adopt.

Through the kindness of Professors J. C. Merriam and B. L. Clark of the University of California, there have been

placed in my hands for study a few specimens of chitons from the collection of the late Dr. J. G. Cooper, which are of interest as having presumably been determined by Dr. P. P. Carpenter. Among these I have been interested to find a single specimen, represented by a few loose valves, of the very insufficiently known "*Trachydermon gothicus*" of Carpenter ('64, p. 649; '66, p. 212). This bears the Catalogue Number 2388 [S. S. B. 478], and was taken by Dr. Cooper at San Pedro, California, on shells of *Haliotis*. At near the same time a second specimen came to me through the generosity of Mr. W. H. Golisch of the Southwest Museum. This one, which is fortunately complete, was found by Mrs. Golisch at Dead Man's Island, San Pedro, California, in 1909 [S. S. B. 1060]. For some time I have felt that *gothicus* constituted a distinct element of its own in the heterogeneous mixture comprised in the Carpenterian genus *Trachydermon*, yet I was not altogether prepared to find revealed a second species of my own group *Dendrochiton* (Berry :11, p. 487), of which *D. thamnopus* (Berry) stands as the type and, up till now, the only known species. This group was founded largely because of its girdle characters, and of course one would not expect the complex and fragile setæ to persist in dried specimens such as these, but in the specimen found by Mrs. Golisch a few pore-like dots are evident opposite the sutures in situations corresponding to the position of the major series of setæ in *D. thamnopus*. From this circumstance, coupled with the fact the shell characters of the two species are evidently but elaborations of the same general plan, I think there is no question that the two are congeneric. On the other hand their specific separation would appear to be easy. The more conspicuous features in which *D. gothicus* differs from *thamnopus* are:

(1) the greater elevation and more acute angle of the ridge;

(2) the much narrower, more numerous (about 13 on the central valves), and straighter ribs of the pleural areas, blending into a rather obscure, fine, irregular, longitudinal threading on the jugal tract;

(3) the relatively solid texture of the interspaces between the pleural ribs; in *thamnopus*, under moderately high

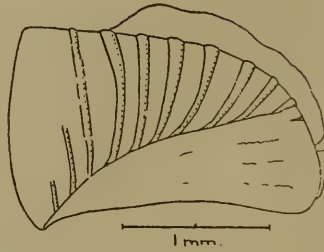


Fig. 1. *Dendrochiton thamnopus* (Berry). Camera sketch of dorsal aspect of right side of valve v of type [8a], from off Monterey.

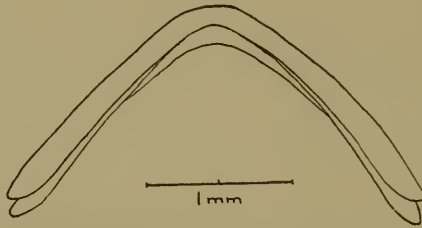


Fig. 2. *Dendrochiton thamnopus* (Berry). Camera outline of valve v of type [8a], anterior elevation.

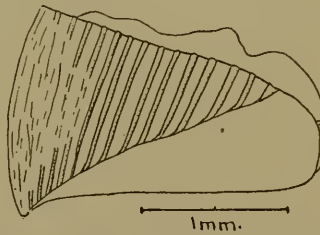


Fig. 3. *Dendrochiton gothicus* (Carpenter). Camera sketch of dorsal aspect of right side of valve iv of specimen [478] from San Pedro.

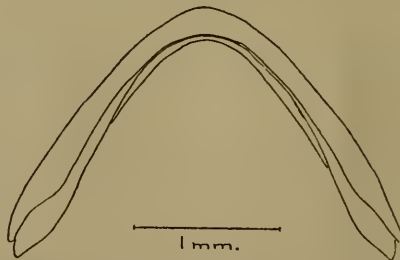


Fig. 4. *Dendrochiton gothicus* (Carpenter). Camera outline of valve iv [478], anterior elevation.



power (x36), these interspaces are conspicuously spongy, while in *gothicus* they are not;

(4) the heavier granulation of the lateral areas.

The two species are of about the same size, and both are brilliantly colored. As a further aid in separating them, I append the accompanying rather rough sketches (text figs. 1-4). No doubt the receipt of good alcoholic material of *gothicus* will reveal additional important features of taxonomic value in the girdle. *Gothicus* is so far recorded only from the immediate vicinity of the San Pedro Channel, *thamnopus* from Monterey Bay. In the original description of the latter species, a *lapsus calami* resulted in the spelling *thamnopora*. The correction to *thamnopus* is made in accordance with Article 19 of the International Code.

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#### 4. NEW CHITONS COLLECTED BY DR. HAROLD HEATH IN MONTEREY BAY, CALIFORNIA

From time to time considerable interesting material in the way of chitons preserved in alcohol, principally from collections made by himself in the neighborhood of Pacific Grove, California, has been placed in my hands for study by Dr. Harold Heath of Stanford University. On the whole the list of species represented in his collections in this region is much the same as that given by Pilsbry ('98) some twenty years ago from material taken by the same collector, but three of the forms now before me, including a member of one genus totally new to our fauna, appear to have been previously undescribed. Preliminary descriptions of these are accordingly given below.

#### Genus *Leptochiton* Gray 1847<sup>1</sup>

#### Subgenus *Xiphiozona* Berry 1919

#### *Leptochiton* (*Xiphiozona*) *heathi* Berry 1919

Pl. 1, figs. 1-2; pl. 2

*Diagnosis*: Shell small, oval, well arched, the jugum obscurely angled; side slopes strongly convex.

Anterior valve with numerous (100-120), closely placed, radial series of minute, low, round, flattened pustules, usually distinct from one another and not overlapping. Median valves not beaked, their sculpture similar to that of the anterior valve; lateral areas not raised, poorly defined, their

<sup>1</sup>I am not entirely certain as to the proper generic name to be used for most of our West American Lepidopleurids. Iredale (:14, p. 127-128) has lately reminded us that by reason of Gray's own designation *Chiton cinereus* must be regarded as the orthotype of his genus *Leptochiton*. This is a Linnean species belonging, as shown by Hanley, to quite a different group than the shells which have been referred to *Leptochiton* by most or all subsequent authors. If this were all, we would at once be barred from using *Leptochiton* in the present connection at all, and this is evidently the opinion of Iredale. But the trouble comes in when we remember, as has been pointed out by Pilsbry ('92, p. 14), that *L. cinereus*, as interpreted by Gray, appears not to be the Linnean form, but really the *Chiton asellus* of Spengler, which is a Lepidopleurid. Whether, under a strict construction of the International Code, we must call *Chiton cinereus* Linnaeus the type of *Leptochiton* Gray, or whether *cinereus* Montagu, Gray, et al. (*non* Linnaeus) can be retained in this office, I cannot decide without access to more of the relevant literature than is now available to me. Nor, if *Leptochiton* be unavailable, can I suggest just what name had best be used in place of it. One has, of course, the option to fall back, for the time being, on the old blanket name *Lepidopleurus* Risso, that long-enduring receptacle for every chiton without recognizably developed insertion plates one is otherwise uncertain what to do with. But as the Californian species seem none of them to be properly congeneric with *L. cajetanus* (Poli), the Mediterranean-Atlantic species which is the type of Risso's genus, I prefer for the present to retain *Leptochiton* with the explanation above given.

granules less regular than those just described, those of the central areas showing a tendency to overlap or coalesce so as to form distinct longitudinal riblets. Posterior valve with similar sculpture; semicircular; mucro conspicuous, much elevated, projected posteriorly, and almost overhanging; posterior slope steep and strongly concave. Margins of tegumentum everywhere finely crenulate.

Interior of valves grayish white, translucent, minutely pitted; median valves thickened at the middle; posterior valve with a conspicuous V-shaped, laterally branching callus. Sinus broad. Sutural laminae triangular.

Girdle narrow, for the most part with a pilose covering of excessively minute, short, pointed spinelets, among which are interspersed sundry long, conspicuous, stiletto-like, or more often curved spines, appearing especially numerous in the neighborhood of the sutures. Marginal spines minute.

Ctenidia 12-16 on a side, extending past the middle of the 6th valve.

Radula with strongly bidentate major laterals.

Color of dorsal surface a warm yellowish brown, very finely and copiously, though variously, mottled with longitudinal and radial streaks of a dark slaty gray. Girdle with dorsal mottlings or almost unicolored.

*Measurements*: Long. 13.1, diam. 7.0 mm.

*Type*: An alcoholic specimen [S. S. B. 123], comprising Cat. No. 3513 of the author's collection. Paratypes deposited in the collections of the California Academy of Sciences, the Academy of Natural Sciences of Philadelphia, the United States National Museum, and the Department of Zoology of Stanford University.

*Type Locality*: 15 fathoms, off Monterey, California; H. Heath, summer, 1908; 12 specimens.

*Remarks*: I have had this species in hand for a number of years without hitherto being able to attach a satisfactory name to it. It is a well marked and not at all a rare form, chiefly characterized by its peculiar coloration and a girdle armature quite unlike that of any of the better known West American species of the genus. For a time I was (very doubtfully) inclined to identify the species with the insufficiently understood *L. nexus* Carpenter 1864, but Carpenter's description

(I have seen no specimens to accord with it) differs too markedly to render such a disposition satisfactory, even if we accept the specimens mentioned by him as a variegated variety of *nexus* (cf. Pilsbry, '92, p. 11) as surely conspecific with the type. Recently the receipt from Dr. W. A. Hilton of Pomona College of a specimen dredged by him in 10 fathoms, off Laguna Beach, California [S. S. B. 404], which agrees very fairly with Carpenter's description of his "variety", confirms the separate identity of the Monterey species, although it evidently belongs to the same section of the genus.

*L. heathi* is particularly marked by its elevated, roundly Gothic-arched outline, poorly delimited lateral areas, steep slope back of the projecting mucro, and minute girdle scales.

The specific name selected is in honor of Dr. Harold Heath, who collected the type.

#### Genus *Hanleya* Gray 1857

#### *Hanleya spicata*, new species

Pl. 1, fig. 3

*Diagnosis*: Shell small, oblong, rather elongate, lateral outline nearly straight.

Valves sharply beaked; lateral areas distinct, but not conspicuous except by transmitted light, not ridged or grooved. Sculpture consisting of numerous rounded tubercles (transparent by transmitted light) irregularly scattered over the lateral areas, but over the central areas slightly smaller and disposed in 14-16 ill-defined, slightly oblique, longitudinal series, most crowded and irregular near the jugum. Head valve sculptured like the lateral areas. Tail valve with mucro somewhat in front of the middle, elevated.

Girdle of moderate width, beset dorsally with numerous, faintly striate, glassy spicules of three main types: 1) very small, ovoid, pointed spinelets, forming a rather loose covering over the entire girdle, these being plainly striate near their apices; 2) elongate, dagger-like, marginal spinelets; and 3) a few scattered, needle-like spines, often over twice the length of the marginal spicules, some of these distributed here and there over the general surface of the girdle, but the greater proportion occurring in loose groups of 5-8 at each

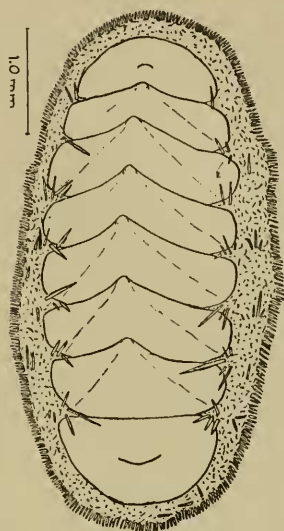


Fig. 5. *Hanleya spicata* Berry. Camera sketch of dorsal aspect of type [63].

suture, where they extend well up between the valves; though distinct, these groups scarcely tuft-like, and unaccompanied, so far as noted, by evidence of sutural or intersutural pores.

Ctenidia about 8 on each side.

Color everywhere a pale brown or brownish white, deepening in tone at the beaks, but without other markings.

*Measurements*: Long. 4.5, diam. 2.0 mm.

*Type*: A specimen mounted in balsam [S. S. B. 63], Cat. No. 4102 of the author's collection.

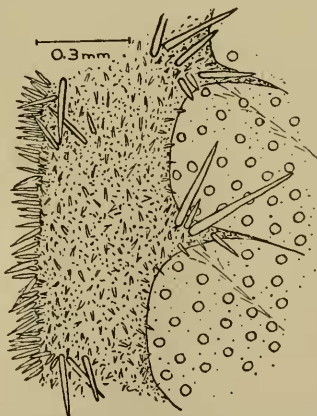


Fig. 6. *Hanleya spicata* Berry. Camera sketch of edge of valves ii and iii, with adjacent portion of girdle [63].

*Type Locality:* From ledge off Point Pinos, Monterey Bay, California; depth "probably 200 feet"; H. Heath, summer, 1904; 1 specimen.

*Remarks:* This small species possesses no very remarkable characters of its own, except the presence of the conspicuous groups of sutural spines on the girdle. It is undoubtedly nearest to the circumpolar *H. hanleyi* (Bean 1844), from which the sutural spines and more sparse granulation (cf. Pilsbry, '92, pl. 3, f. 72) are here relied upon to distinguish it. The girdle also appears notably wider in proportion to the width of the valves, upon which it somewhat encroaches at the sutures. The specimen is quite likely not mature, so it is uncertain just how much value should be reposed in the features outlined. Eventually *H. spicata* may prove only a variant of the older species, but the balance of evidence at the present time appears to me in favor of its distinctness.

The species itself is not of so great interest as the fact that it for the first time establishes the genus *Hanleya* in Pacific waters. Thiele, however, (:09, p. 15) has reported a specimen of *H. hanleyi* from Plover Bay, Siberia (Bering Sea).

#### Genus *Mopalia* Gray 1847

#### *Mopalia phorminx* Berry, 1919

Pls. 3-5

*Diagnosis:* Shell small, elongate-oval, only moderately elevated; dorsal ridge carinate; side slopes straight. Entire surface finely granulose.

Anterior valve with 8 radiating series of coarse, closely placed, downwardly directed, almost overlapping, pointed pustules, 9-10 in a series, one or rarely two series of smaller and more widely separated but otherwise similar granules occurring in alternation; in addition to above, each posterior margin dentated by a series of larger, more elongate, backwardly directed tubercles, so that including these the number of primary radial series is 10; between the posterior series and the next of the primary series in front are three of the secondary series above noted, the median of which is composed of larger tubercles than the other two.



Median valves: lateral areas not in themselves raised, but in front showing a strong, diagonal, rib-like succession of about 10 coarse, somewhat overlapping pustules like those of the primary series on the head valve; on the sutural margin behind a series of large, backwardly directed tubercles like those of the postero-marginal series of the head valve; the flattened area between these two series heavily and closely pustulose with 2-5 variously sized, radial series of granules, with sometimes also one or two similar series in front of the main diagonal rib. Central areas on each side elegantly sculptured with 10-14 sharp, flexuose, longitudinal ribs, curved at first with the concavity inward, but the longer ribs showing a secondary curve in the reverse direction toward the anterior margin; outer ribs more or less broken behind, sometimes resulting in the formation of the aberrant series of granules already noted; inner face of ribs buttressed by numerous, irregular, claw-like, transverse ridges extending part way across the otherwise merely granular interspaces; inside ribs more oblique and shorter, in valves iii-vii fusing anteriorly with a single rather weak, median rib along the ridge; valve ii with the jugal rib bifurcating anteriorly, a new median rib developing between the forks, the adjacent ribs of the central areas at the same time more or less anastomosing.

Posterior valve with the mucro little elevated, strongly posterior in position, the area in front of it sculptured like the central areas of the median valves, but with only 7-8 ribs on a side; posterior area coarsely, irregularly, concentrically rugose, the rugosities best developed in front, where they tend to form a sort of pseudo-rib; slope behind mucro slightly concave.

Interior of anterior and intermediate valves slightly thickened across the middle. Posterior valve with a strong crescentic callus behind, and a strong, V-shaped, median callus. Teeth short and broad, their bounding fossa at the base shallow but distinct. Sutural laminae of intermediate valves wide, arcuate, in tail valve more angular at margin; sinus narrow and relatively deep. Insertion slits with rather indistinct radial lines of transversely slit-like pores leading into them. Eaves short and inconspicuous. Anterior valve with



8, intermediate valves with 1-1, posterior valve with 1-1 slits and a strong bay or sinus in the medio-posterior margin.

Girdle rather narrow, clothed above with a fine armature of numerous, microscopically minute spinelets, and in addition bearing a large number of beard-like setæ in several series, one, which we may denote as the primary or sutural, comprising much larger, darker colored, and very definitely placed bristles, as compared with those of the other series, one standing in the angle of each suture, two behind the tail valve, and perhaps six or seven around the head valve; remaining setæ more numerous near margin; all more or less broken in the specimen at hand. Individual setæ long, slender, bearing numerous, slender, recurved, hair-like branches along the upper side.

Ctenidia 14 on a side.

Color of outer surface of shell a soiled brownish cream, abundantly painted and mottled with light yellowish brown. Interior of shell white. Girdle brownish.

*Measurements*: Maximum length of type specimen, 16.5; maximum width, 9.0; altitude, 3.0; length of shell only, 15.0; width of tegmentum in valves iv. and v., 7.0 mm.

*Type*: A specimen preserved in alcohol [S. S. B. 549], comprising Cat. No. 1769 of the author's collection.

*Type Locality*: On a fragment of rock from ledge off Point Pinos, Monterey Bay, California; "depth probably 200 ft.": H. Heath, summer, 1904; one specimen.

*Remarks*: This very odd appearing little chiton is evidently a member of the same group as the two Carpenterian species, *sinuata* and *imporcata*, but is readily distinguishable from either by its unique and very elegant pattern of sculpturing, notably by such details as the heavy pustulation of the lateral tracts and the sinuous, buttressed riblets of the central areas.

No specimens other than the type have thus far come to hand.

The specific name is derived from the Greek *φόρμινξ*—a much ornamented kind of lyre, and is chosen primarily with reference to the above-mentioned sculpturing of the central areas.

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## 5. A NEW MOPALIA FROM SOUTHEASTERN ALASKA

The first note in the present series (Berry, :17) was devoted to a preliminary discussion of a collection of chitons collected by Mr. George Willett in southeastern Alaska, chiefly at Forrester Island, from 1913 to 1916. Some of this material, particularly among the smaller Mopaliidæ, I found myself unable at that time to identify to my satisfaction. Certain later material which has since been handed me by Mr. Willett shows that one of the species represented, although one of the most interesting of all the Mopalias, is apparently an undescribed form. A diagnosis is accordingly offered below.

**Mopalia egretta** Berry 1919

Pls. 6-7

*Diagnosis:* Shell rather small, elongate-oval in outline, moderately elevated, with a sharply carinate, somewhat pinched-in, dorsal ridge; side slopes slightly, though distinctly arcuate; valves slightly beaked. General surface very finely pitted rather than granulose.

Anterior valve with eight radiating series of strong, regularly increasing, closely ranked, rather smoothly rounded tubercles, 7-8 in a series; posterior edge of valve dentated by a pair of similar series of larger, more compressed and backwardly directed tubercles; entire surface between these rib-like series rather finely sculptured by a quite uniform reticulum of pitting and netting arranged almost in a checker pattern; all sculpture worn or obsolete toward apex.

Median valves with lateral areas strongly elevated; general surface of these sculptured like the anterior valve; bounded behind by a sutural series of 9-10 strong, oblique tubercles dentating the suture, and in front by a much wider, stronger diagonal rib, formed by the partial coalescence of its component, strongly transversely elongate, compressed tubercles, and often more or less bifurcated by a shallow furrow down its center. Central areas very neatly sculptured by strong, inwardly arching, longitudinal riblets, traversed by slightly more zigzag, and otherwise rather less regular, obliquely arcuate riblets radiating from the beak and ridge, the whole forming a very regular net-like reticulum, the meshes of which are represented by fairly deep, squarish pits, always larger and deeper toward the sides; the posteriormost of the radial threads characteristically stronger than any of those in front, and the pits enclosed between it and the diagonal rib larger and deeper than those in front of it, thus sharply setting off the diagonal rib and lateral areas from the central areas; jugal area in the posterior two or three valves with a very narrow smooth tract on the ridge, the netted sculpturing in the other valves extending clear over, merely becoming a little less regular on the ridge where the central areas come together.

Posterior valve with the mucro at about the posterior third of the tegmentum, scarcely elevated; diagonal ribs weaker than those of the intermediate valves; area in front sculptured similarly to the central areas of the intermediate valves, but with fewer ribs on a side, and although the pits in front of the diagonal ribs are a little larger than the remainder, the difference is less conspicuous here than in the other valves; posterior area sculptured with irregularly nodulose, longitudinal ribs, corresponding in position to the

tubercles of the diagonal rib and the riblets in front, the innermost ones bending in abruptly behind toward the deep, acute,  $\Lambda$ -shaped caudal sinus.

Interior of anterior valve with the eight whitish radial lines leading to the marginal slits very conspicuous, each accompanied by a series of seven or eight transversely slit-like pores in the overlying translucent articulamentum. Intermediate valves with a slight transverse thickening across the middle; whitish lines radiating to the slits as in the anterior valve, but the overlying pores 12 or more in number. Posterior valve with 2-3 of the pores conspicuous below the slits, but the white lines not visible, perhaps because of the heavy, transverse, posterior callus; an oblique thickening also extends forward on each side of the central depression leading to the sutural sinus. Teeth in all valves but the last short, broad, squarish; insertion slits bounded on each side by conspicuous tile-like upturnings of the edges of the teeth and sutural laminae. Sutural laminae of intermediate valves exceedingly thin and fragile, very broad, only slightly arcuate in front, the sinus small and narrow; posterior valve with proportionally rather longer, more sinuous laminae, the narrow sinus sharply squared at the base; caudal sinus of articulamentum about as in tegmentum but more rounded at apex.

Eaves short, thin, sharp; very slightly projecting over the thin layer of coarsely spongy tissue beneath. Anterior valve with 8, intermediate valves with 1-1, posterior valve with 1-1 slits.

Girdle moderately wide, only slightly encroaching at the sutures; sharply slit posteriorly; dorsal surface covered with numerous very minute spines or scales, with larger dirk-shaped spinelets at the margin; inner central portion devoid of setae; sutural setae conspicuous, long, erect, comprising each a long, slender, curved, amber-colored bristle, from the basal portion of which are given off on the upper side numerous nearly straight, long slender, needle-like, whitish aciculæ; four such setae around the head valve, one in the angle of the first six sutures, one nearly halfway out on the girdle on each side opposite the last suture, and one very strongly tufted unpaired seta in the caudal sinus a little less than half

way between the shell margin and the apex of the slit in the girdle; remaining series of setæ about four in number, much smaller, all on the outer third of the girdle, those of the more marginal series very minute and more bushy (i. e., their spines less asymmetrically arranged) than the sutural setæ, those of the inner series progressively larger and except for their smaller size and somewhat shorter aciculæ similar in general makeup to the sutural setæ.

Ctenidia about 20 on a side.

Color of tegmental surface of shell a rather light brownish or brick red, with more or less brownish-maroon and gray-buff maculation, the latter color usually prevailing on the third valve and sometimes the seventh as well; in one specimen the sides of valve vii being light yellow. Upper surface of girdle green in the type, reddish in all other specimens. Interior flesh tinted, shading darker in the deeper portions.

*Measurements*: Maximum length of type specimen, 20.0; maximum width, 11.2; altitude, 3.7; length of shell only, 18.3; width of tegmentum in valve iv., 8.5 mm.

*Type*: A specimen preserved dry [S. S. B. 281], entered as Cat. No. 3939 of the author's collection. A paratype collected in 25 fathoms by Willett in 1914 [S. S. B. 285] is deposited in the collection of the California Academy of Sciences, and another taken in 15-20 fathoms in 1917 [S. S. B. 641] is in the private collection of Mr. George Willett<sup>2</sup>.

*Type Locality*: 20 fathoms, Forrester Island, Alaska; George Willett, August 5, 1915; two specimens.

*Remarks*: Though ranking among the smaller and less conspicuous forms, close acquaintance reveals *M. egretta* as one of the most beautiful of all the *Mopalias*. It is one of the Forrester Island species which Mr. Willett obtained on several occasions, though never in any numbers, and to which I referred on pp. 239-240 of the first paper of the present series. His discovery of another specimen in 1917 served to confirm the validity of the diagnostic characters I

<sup>2</sup> A specimen in alcohol [284] and a series of dislocated valves [640] have also been drawn upon for portions of the foregoing description and therefore rank as paratypes. These are at present in the author's collection.

had previously outlined in MS. and convinced me that the species was properly regarded as distinct. It is not closely similar to any of our other West American types except only the peculiar little *M. sinuata* of Carpenter. With this, in dried specimens at least, one finds a degree of careful discrimination necessary, although the present species is distinguished by the following important and, in the scanty material I have had available, apparently constant characters:

- 1.) Considerably larger size ( $\times$  about  $1\frac{1}{2}$ ).
- 2.) Much less high-arched outline.
- 3.) Distinctly arcuate side slopes.
- 4.) Bright reddish coloration.
- 5.) Distinctly raised lateral areas.
- 6.) Heavier and more coarsely pustulose diagonal rib.
- 7.) Heavier dentation of the sutures, which is strong and distinct in *egretta*.
- 8.) Fewer and coarser longitudinal ribs of central areas in shells of the same size.
- 9.) Strong pitting and appearance of an incipient secondary riblet in front of the diagonal rib.

Unfortunately none of the Forrester Island *sinuata* were preserved in alcohol, so a direct comparison of the girdle characters as they exist in adequately preserved material cannot be made, though even the dried shells indicate that here also are interesting differences. A single alcoholic specimen of *egretta* [284] has furnished the basis for the description of the girdle given in the foregoing diagnosis. A curious circumstance in both this and the dried specimens is that the setæ frequently carry one or more encrusting foraminifera.

The specific name *egretta* is chosen because of the resemblance of the sutural setæ to small egret plumes.

#### LITERATURE CITED.

Berry, S. S.

:17. Notes on West American Chitons—I. <Proceedings California Academy Sciences, (4), v. 7, pp. 229-248, text figs. 1-4, September, 1917.



## 6. A NEW LEPIDOZONA FROM SOUTHERN CALIFORNIA

For several years past various specimens have been accumulating in my hands which do not seem referable to any of the described species. Some of these, particularly from among the *Mopaliidæ*, I shall withhold for the present in the hope of securing more or better material, but there are certain ones of which I either have had ample material, or else see no immediate hope of getting more, or which are likely to be referred to in forthcoming papers of this series, hence must needs be published. A preliminary diagnosis of one of these forms is therefore offered in the following pages, while others will be published in succeeding papers of the series. These descriptions are purposely made as brief as the exigencies of an exact identification of the species referred to will permit. The results of my examination of the radula, the microscopy of the girdle armature, and some other features are held over for a later work, in which it is intended to describe, illustrate, and discuss all the western North American species in as much detail as possible.

*Ischnochiton* (*Lepidozona*) *asthenes* Berry 1919

(Pl. 8)

*Diagnosis*: Shell small, thin, nearly lusterless, oblong-oval, moderately elevated, carinate along the ridge, the side slopes convex; valves barely beaked behind. General surface strongly rough-scaly-granulose, this condition prevailing over the head valve, the lateral and jugal areas of the intermediate valves, and the jugal and posterior areas of the tail valve; on the pleural areas obscured or replaced by the fine sculpturing.

Anterior valve with 11 or rarely 12 low, broad, rounded ribs or flutings, bearing traces of radial series of minute, easily abraded pustules, 2-4 in a series, though in absolutely non-abraded specimens there would no doubt be a few more; grooves between ribs shallow and narrow, but fairly distinct.

Intermediate valves with lateral areas distinctly raised and strongly radically bicostate<sup>3</sup>, the ribs broad, flattened, or the center of each even somewhat obsoletely grooved, their dividing

<sup>3</sup> The lateral areas are apparently rarely tricostrate, as witnessed by the second valve of one of the specimens.



sulcus narrow, but distinct; each rib ornamented by two or sometimes only one series of small, easily abraded pustules similar to those of the anterior valve, 2-5 in a series; central areas on each side sharply and finely sculptured with 15-18 narrow, minutely granulose, longitudinal riblets, finely interlatticed between so as to resemble knitted work; jugal tract usually devoid of distinct ribbing or other sculpturing except the scaly granulation already noted, though sometimes a continuation of the pleural sculpturing is evident extending to the ridge as a more or less obsolete, irregular reticulum.

Posterior valve with mucro well in front of the middle, and the posterior slope nearly straight; region behind mucro with sculpture similar in nature to that of the anterior valve, but in every way weaker and sometimes nearly obsolete; region in front sculptured like the central areas of the intermediate valves.

Articulamentum transparent, hyaline, that of the intermediate valves somewhat thickened across the middle. Sutural laminae thin, sharp-edged, broadly arcuate, connected across the sinus by a short, very delicate, weakly and rather irregularly dentate plate, apparently surmounted by an extremely thin, delicate, anteriorly projecting rounded process of the tegmentum forming a sort of "false beak". Insertion teeth sharp, distinct, their edges perhaps sometimes very weakly crenulate. Eaves thin, more or less fluted, rather projecting, but shorter than the teeth. In a dissected specimen anterior valve with 9, intermediate valves with 1-1, posterior valve with 12 slits.

Girdle very delicate and fragile in dried specimens; moderately wide; covered dorsally with a rather irregularly imbricating armature of delicately ribbed-striate, convex scales, rather small, but not proportionally to the size of the shell, the ribs about 8-11 in number on each scale.

Color of outer surface of shell a yellowish brown, under a lens seen to be more or less mottled with a deeper tone. Girdle usually maculated above by alternating bands of brown and tan, corresponding respectively in position with the sutures and valves. Interior of shell hyaline or slightly porcellanous, underlain with white, and with the gray or brown of the tegmentum showing through.

*Measurements:* Maximum length of largest specimen [471a], 9.5; maximum width, 5.9; altitude, 1.4; length of shell only (est.), 8.5; width of tegmentum of valve iv., 3.9 mm.

*Type:* A shell preserved dry [S. S. B. 466], entered as Cat. No. 3913 of the author's collection. Paratypes have been deposited in the collections of the California Academy of Sciences, the Academy of Natural Sciences of Philadelphia, the United States National Museum, and the private collection of Mr. Allyn G. Smith.

*Type Locality:* Under stones at low tide, White's Point, Los Angeles County, California; Allyn G. Smith, August 14-18, 1916; 70 specimens.

*Remarks:* It is a surprise to find a littoral species of such abundance apparently undescribed, yet after the most exhaustive comparisons possible to me, I have been unable to identify this very neat little species with any of the described forms. I have been at particular pains in this connection to re-examine the descriptions of the numerous *Ischnochiton*s described by Carpenter from Central and Southern California, more especially since several of these still lack authentic rediscovery and are but very insufficiently known. Without access to the original specimens this naturally becomes a hazardous task, but nevertheless I feel reasonably safe in the conclusion reached.

The descriptions of *I. scabricostatus* remind one very much of the present species, but fortunately I have seen authentic specimens of this, and the comparison shows that it differs distinctly in its conspicuously greater elevation, more numerous ribs (3-5) of the lateral areas, and also (24-30) of the anterior valve, and the fact that the lateral areas are only slightly raised. The two species resemble one another in the short, wide, dorsal girdle scales, more polished and perhaps somewhat smaller in *scabricostatus*, and in the scaly-granular character of the surface of the shell.

*I. retiporosus* of northern waters impresses one as perhaps being somewhat near of kin, but still no special comparison is necessary to distinguish them.

Minus a good lens, *I. asthenes* might at first glance be confounded with the young of *Callistochiton decoratus punc-*

*tocostatus* Pilsbry, but differs in 1) the lower and more regular radial ribs of the anterior valve; 2) the much more numerous ribs and finer reticulation of the central areas; 3) the more strongly carinate ridge; 4) the two rows of easily abraded pustules on each rib of the lateral areas; 5) the fine granulation of the lateral areas, and 6) the posterior area of the tail valve being finely granular, perhaps sometimes with small pustules like those of the lateral areas, but not distinctly ribbed.

The specific name chosen has reference to the fragile nature of the valves and girdle.

NOTE: Owing to an unlooked for delay in the publication of the foregoing paper, and the necessity of using the names in another connection, certain of the taxonomic terms originally intended to be used for the first time here have already been briefly characterized in *Lorquinia*, v. 2, pp. 44-47, January 6, 1919. This reference should therefore be added to the preceding bibliographies of relevant literature.)

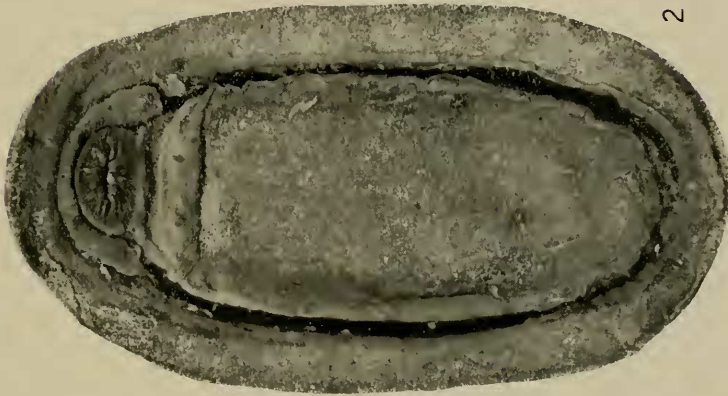
All of the illustrations in the accompanying plates are from photographs by John Howard Paine.

## EXPLANATION OF PLATE 1

Fig. 1. *Leptochiton heathi* Berry. Dorsal view of entire animal (type)  
[123]: x 7.

Fig. 2. *Leptochiton heathi* Berry. Ventral view of entire animal (type)  
[123]: x 7.

Fig. 3. *Hanleya spicata* Berry. Dorsal view of entire animal (type)  
[63]: x 15½.









## EXPLANATION OF PLATE 2

Fig. 1. *Leptochiton heathi* Berry. Dorsal view of head valve of paratype [124a]: x 12½.

Fig. 2. *Leptochiton heathi* Berry. Dorsal view of fourth valve of paratype [124a]: x 12½.

Fig. 3. *Leptochiton heathi* Berry. Dorsal view of tail valve of paratype [124a]: x 12½.

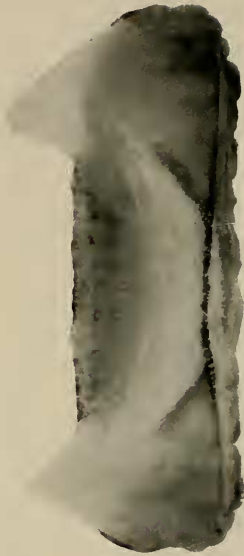
Fig. 4. *Leptochiton heathi* Berry. Interior view of head valve of paratype [124a]: x 12½.

Fig. 5. *Leptochiton heathi* Berry. Interior view of fourth valve of paratype [124a]: x 12½.

Fig. 6. *Leptochiton heathi* Berry. Interior view of tail valve of paratype [124a]: x 12½.



4



5



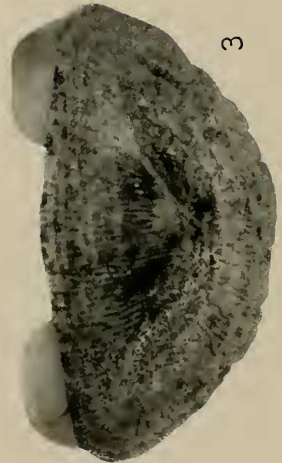
6



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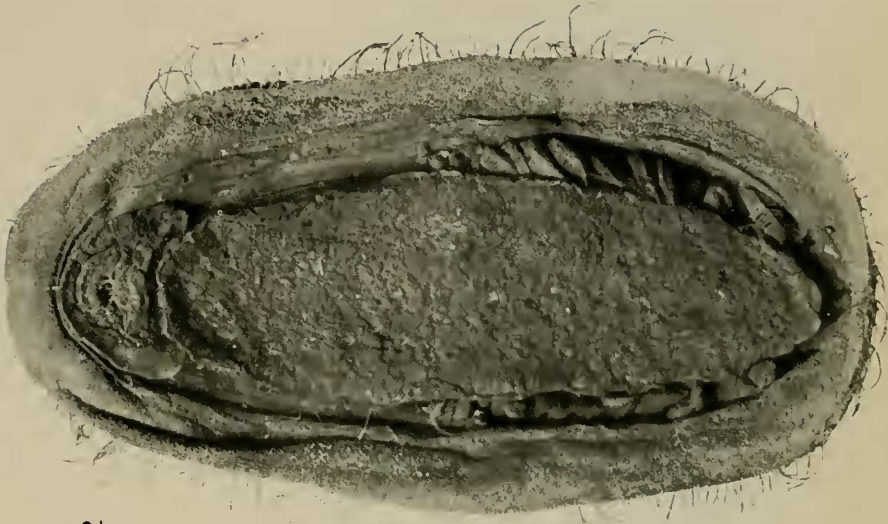




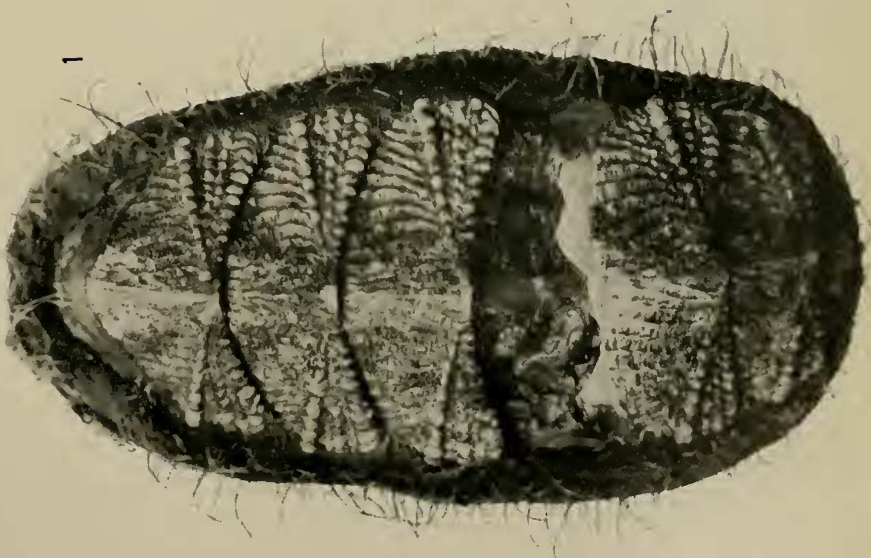
## EXPLANATION OF PLATE 3

Fig. 1. *Mopalia phorminx* Berry. Dorsal view of entire animal (type) after removal of valves i, v, and viii [549]: x 7.

Fig. 2. *Mopalia phorminx* Berry. Ventral view of entire animal (type) [549]: x 7.



2



1





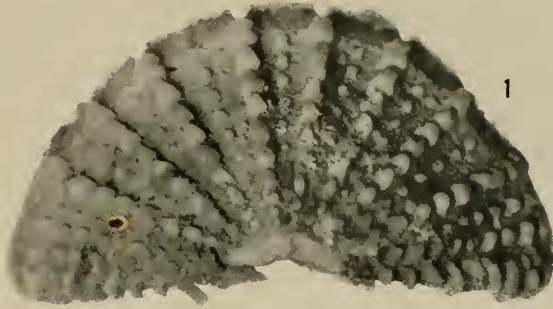


## EXPLANATION OF PLATE 4

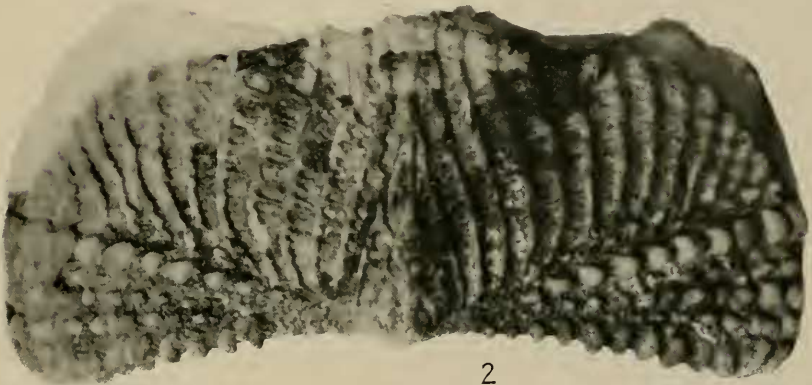
Fig. 1. *Mopalia phorminx* Berry. Dorsal view of head valve of type [549]: x 15.

Fig. 2. *Mopalia phorminx* Berry. Dorsal view of valve v of type [549]: x 15.

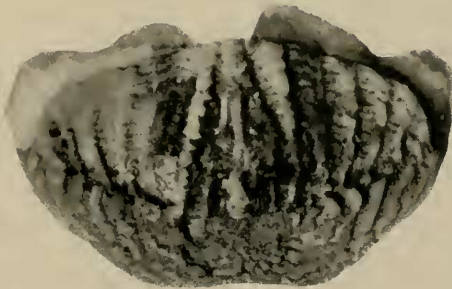
Fig. 3. *Mopalia phorminx* Berry. Dorsal view of tail valve of type [549]: x 15.



1



2



3

